植物研究雑誌
J. Jpn. Bot.
73: 92–101 (1998)

Morphological and Anatomical Features of Nectary on Calyx-Tooth of the Genus *Vicia* (Leguminosae) and Their Systematic Utility

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(Received on September 23, 1997)

Distributional patterns of glandular hairs on abaxial surface of calyx-tooth were observed in 30 species of subgenus Vicia of genus *Vicia* (Leguminosae). Two types of calyx-teeth are recognized by distributional patterns of glandular hairs; Type-1 has a few glandular hairs sparsely scattering on the whole surface; Type-2 has many glandular hairs densely gathering at the center of the teeth. The Type-2 was observed in 16 species and is divided into two subtypes as follows: Subtype A is flat at the spot of gathering glandular hairs; Subtype B is sunken at the spot. Evolutionary polarities of the characteristics of the calyx-tooth are presumed by the out-group rule as follows: 1, a few glandular hairs sparsely scattering on the whole surface on calyx-tooth → many glandular hairs gathering at the center of the tooth; 2, calyx-tooth flat at the spot of gathering glandular hairs → the tooth sunken at the spot. The second apomorphy is considered to be important for classifications of sections in the subgenus Vicia.

Genus *Vicia* is composed of about 140 species (Kupicha 1981). These species are classified into two subgenera, Vicilla and Vicia (Kupicha 1976). Subgenus Vicia is composed of 37 species (Maxted 1993) and is distinguished from subgenus Vicilla by stipular nectary (Kupicha 1976), which is composed of densely gathering of glandular hairs (Gams 1924). The stipular nectary was presumed to be an autapomorphy of subgenus Vicia (Endo and Ohashi 1996). Gunn (1979) and Barneby (1989) reported that *V. sativa* L. has nectaries on abaxial surfaces of the lateral two and the lowest calyx-teeth. Barneby (1989) also reported that the nectary of calyx-tooth was similar to the stipular nectary. This means that the nectary of calyx-tooth is composed of gathering of glandular hairs. Maxted et al. (1991) and Maxted (1993, 1994) reported independently from the works by Gunn (1979) and Barneby (1989) that three patterns of appearance of the nectary on calyx-teeth in subgenus Vicia as follows: 1, absent on all teeth; 2, present on lateral teeth; and 3, present on all teeth. There still remains, however, several questions on the nectary of calyx-tooth in subgenus Vicia: 1, what morphological variations the nectaries on calyx-tooth show?; 2, what differences are there between the stipular nectary and the nectary on calyx-tooth?; 3, is there any evolutionary polarity in characteristics of the nectary on calyx-tooth? We intend to answer these questions and discuss systematic utility of the nectary in the present study.

Materials and Methods

We examined 30 species of subgenus Vicia which amounted to about 81% of total species number of the subgenus. The representative voucher specimens of the species examined were listed in appendix.

To discuss evolutionary polarities of characteristics of the nectary on calyx-tooth, we examined representative species of related outgroup of subgenus Vicia, i.e., *Vicia americana* Mühl. ex Willd., *V. dumetorum* L., *V. magellanica* Hook. f., and *V. onobrychioides* L.

Observations were made by a dissecting microscope and scanning electron microscope (SEM). For SEM, materials fixed in FAA were dehydrated with an ethanol series. After the dehydration, the materials were removed into isoamyl acetate and critical-point dried. Then the materials were observed by a Hitachi S-800 SEM. To observe transectional surfaces of the FAA materials by SEM, the materials were cut by razor blades before dehydration.

Results and Discussion

Distributional patterns of glandular hairs on calyx-teeth On leaves of genus *Vicia*, two types of hairs have been known (Shah and Kothari 1973, Kupicha 1977), i.e., unicellular hairs and short-stalked glandular hairs. We observed unicellular hairs and short-stalked glandular hairs on calyx-teeth (Fig. 1). These hairs are corresponding to the two types of hairs of the leaves. We found two distributional patterns of glandular hairs on the abaxial surfaces of the calyx-teeth in subgenus Vicia. One is a pattern with a few glandular hairs sparsely scattering on whole surface (Fig. 2) and the other is with many glandular hairs gathering nearly the center of the teeth (Figs. 3–5). We call the former Type 1 and the latter Type 2 in this paper.

The Type 2 is divided into Subtype A and Subtype B by the shape of surfaces of calyx-teeth at glandular hairy spots (Figs. 6, 7), thickness of the epidermal cells (Figs. 8, 9), and thickness of cell layers under the epidermal cell layer (Figs. 8, 9). Differences between the two subtypes are shown in Table 1. In the Subtype A, density of the glandular hairs varies from low (Fig. 3) to high (Fig. 4). In the Subtype B, the glandular hairs densely gathered without any spaces between them. Distribution of the Subtype A and the Subtype B in each of five calyx-tooth positions of the species examined is presented in Table 2.

From Table 2, we recognize six patterns of appearance of the Type 2 in five calyx-teeth of one calyx: 1, absent on all teeth; 2, present on the lowest tooth; 3, present on a pair of lateral teeth; 4, present on lower three teeth; 5, present on upper four teeth; 6, present on all teeth.

Comparison between the spot with gathering glandular hairs of calyx-tooth and stipular nectary All species of subgenus Vicia have been known to have a stipular nectary which is composed of densely gathering of glandular hairs (Kupicha 1976) without any space between them (Fig. 10). The epidermal cells are thinner at the spot of nectary than cells of the surrounding area, and the several layers of cells under the epidermal cells are thinner at the stipular nectary than the surrounding area (Fig. 11). These differences of thicknesses of layers of cells produce a shallow pit which enclose glandular hairs to form a stipular nectary. The stipular nectary seem to be similar to glandular hairy spots of Subtype B calyx-tooth from morphological and anatomical points of view.

Infraspecific variation of calyx-tooth types Presence or absence of the Subtype B is stable at the lateral calyx-tooth positions in almost all species examined except for *Vicia pyrenaica* L. (Table 1). *Vicia pyrenaica* has the Subtype B at lateral and/or the lowest calyx-teeth but sometimes has not. On the other hand, there are some infraspecific varia-

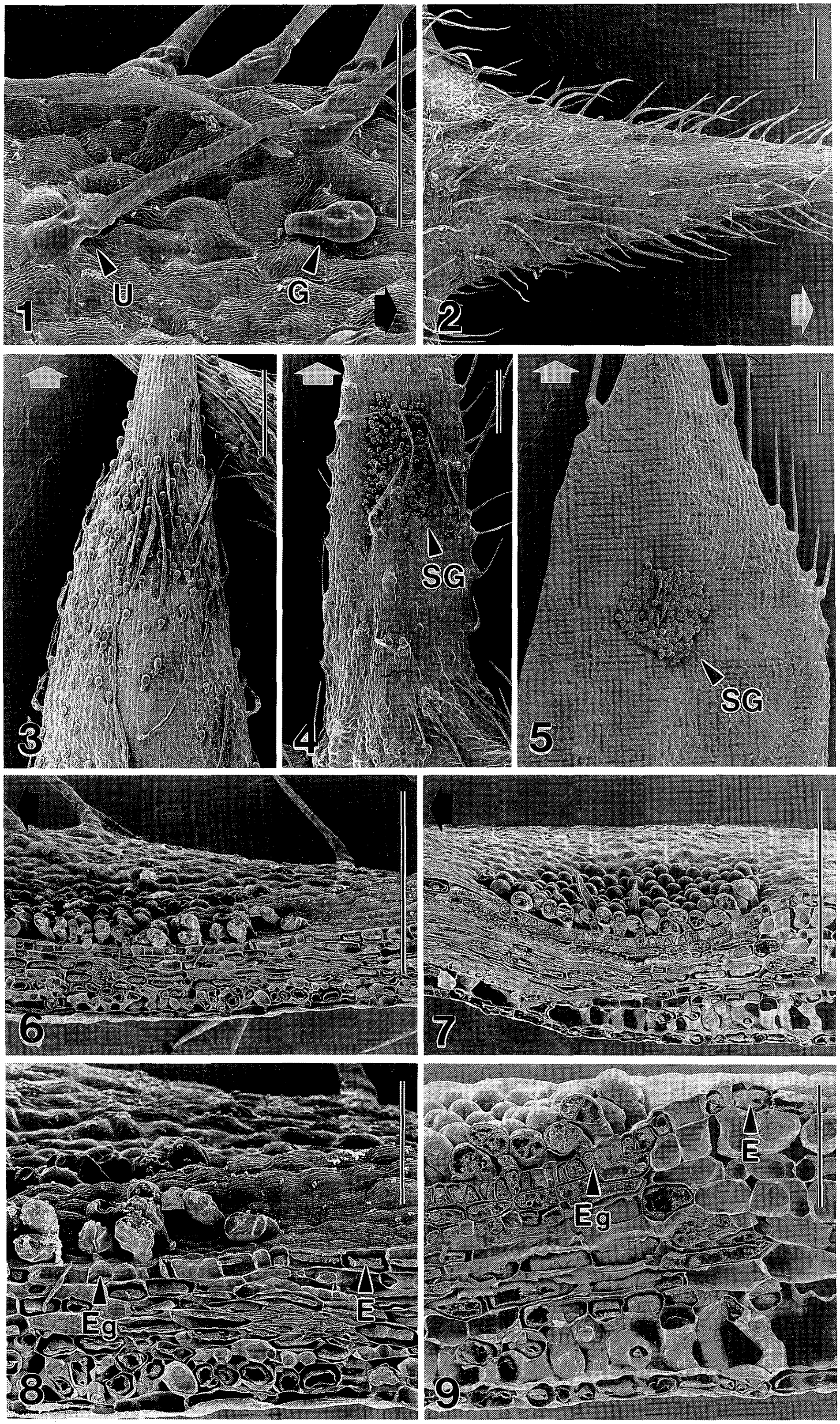

1
U
G
2
3
4
SG
5
SG
6
7
8
Eg
E
9
E
Eg

Table 1. Two subtypes of Type 2 calyx-teeth in subgenus Vicia

Characters	Characteristics	
	Subtype A	Subtype B
Shape of surfaces	Flat (Fig. 6)	Sunken at glandular hairy spot (Fig. 7)
Thickness of the epidermal cells	Uniform (Fig. 8)	Thinner at glandular hairy spot (Fig. 9)
Thickness of cell layers under the epidermal cells	Uniform (Fig. 8)	Thinner at glandular hairy spot (Fig. 9)

tions of presence or absence of the Subtype A. For example, *V. sativa* agg., *V. grandiflora*, and *V. pannonica* sometimes have the Subtype A but sometimes have not (Table 1).

Evolutionary polarities of the characters of calyx-teeth We used out-group rule (Wiley 1981) in order to decide evolutionary polarities of characters of calyx-teeth in subgenus Vicia. We choose several species of a tufted style group (Endo and Ohashi 1996) of subgenus Vicilla as a related out-group of subgenus Vicia, because the tufted style group was presumed to be monophyletic and includes subgenus Vicia (Endo and Ohashi 1995, 1996, 1997). The species of the tufted style group of subgenus Vicilla were classified into five sections by Kupicha (1976). Each one species from four of these five sections were observed as the representative of the related out-group. They are *V. americana*, *V. dumetorum*, *V. magellanica*, and *V. onobrychioides*. These four species have calyx-teeth without gathering of glandular hairs. From this fact the related out-group is presumed to have calyx-teeth without gathering of glandular hairs. We can presume that such calyx-teeth to be a plesiomorphy. Following evolutionary polarities of the characteristics of the calyx-tooth are, therefore, presumed in subgenus Vicia: 1, a few glandular hairs scattering on whole calyx-tooth → many glandular hairs gathering on the center of the tooth; and 2, surface of calyx-tooth flat at the spot with gathering of glandular hairs → sunken at

Figs. 1–9. SEM photos of abaxial surfaces and transectional surfaces of calyx-teeth of subgenus Vicia of genus *Vicia*. 1. Unicellular hair and short-stalked glandular hair of *V. angustifolia*. 2. Upper calyx-tooth of *V. angustifolia* with a few glandular hairs. 3. Upper calyx-tooth of *V. peregrina* with many glandular hairs sparsely distributed. 4. Lateral calyx-tooth of *V. angustifolia* with many glandular hairs densely gathered. 5. Lateral calyx-tooth of *V. narbonensis* with many glandular hairs densely gathered. 6. A transectional surface of calyx-tooth of *V. angustifolia* at the spot with many glandular hairs gathered. 7. A transectional surface of calyx-tooth of *V. narbonensis* at the spot with many glandular hairs gathered. 8. Enlargement of Fig. 6. 9. Enlargement of Fig. 7. Thick arrows indicate the apical direction of calyx-teeth. Voucher specimens: 1, 2, Endo 3006; 3, Endo 2827; 4, Sakai et al. in 1983; 5, 7 & 9, Endo 2832; 6 & 8, Endo 2846. Scale bars = 0.3 mm in Figs. 2–5, 6 & 7, and = 0.1 mm in Figs. 1, 8 & 9. Abbreviations: E, epidermal cell; Eg, epidermal cell under glandular hair; G, glandular hair; SG, spot with gathering of glandular hairs; U, unicellular hair.

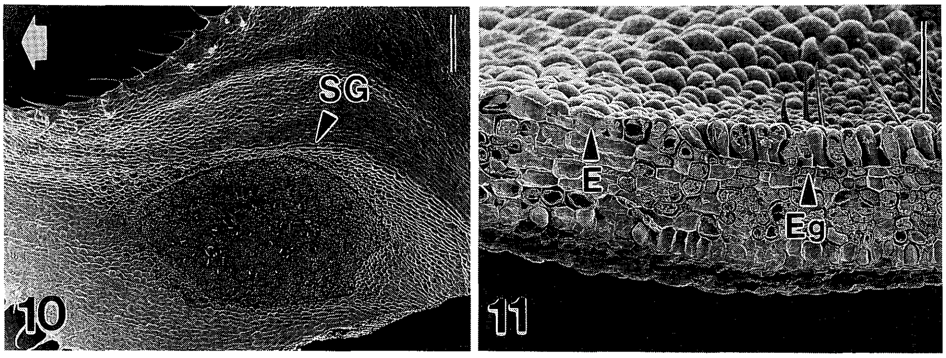
Table 2. Distribution of the characteristics of calyx-teeth in genus *Vicia*[a]

Species	1[b]	2[c]	3[d]	Voucher specimen
V. sativa agg.[e]	–	–	–	Endo 3006
	A	A	–	Sakai et al. in 1983
	A	A	–	Endo 2846
	A	A	–	Shimizu et al. in 1980
	A	A	–	Popov in 1926
	A	A	A	Sakai et al. in 1983
V. grandiflora	–	–	–	Endo 2824
	A	–	–	Bujorean in 1933
	A	A	–	Freeman 42
	A	A	–	Malos in 1963
V. pannonica	–	–	–	Bujorean in 1926
	–	–	–	Witte 15991
	A	A	A	Endo 2831
	A	A	A	Bruijn 2147
V. aintabensis	–	A	–	Samuelsson in 1933
V. anatolica	–	A	–	Maxted et al. 4498
	–	A	–	Cheese & Wabson 1316
V. melanops	–	A	–	Maxted et al. 4321
	–	A	–	Maxted et al. 4413
	–	A	A	Maxted et al. 4454
	A	A	A	Maxted et al. 4440
V. sericocarpa	A	A	–	Maxted et al. 1975
	A	A	A	Maxted et al. 2196
	A	A	A	Maxted et al. 2262
V. oroboides	A	A	A	Endo 2845
V. peregrina	A	A	A	Endo 2827
	A	A	A	Collector unknown
V. pyrenaica	–	–	–	Forestier
	B	–	–	Bordere in 1857
	B	B	–	Bordere in 1857
	B	A	–	Bordere in 1864
	B	B	–	Bordere in 1864
V. barbazitae	B	B	B	Maxted et al. 4319
V. bithynica	–	B	–	Endo 2830
	–	B	–	Dunant in 1861
V. galilaea var. *faboides*	–	B	–	Davis 42324
	–	B	–	Ascherson
V. hyaeniscyamus	–	B	–	Maxted et al. 1815
	–	B	–	Maxted et al. 1759
	–	B	A	Maxted et al. 1759
	–	B	B	Maxted et al. 1759
V. johannis	–	B	–	Maxted et al. 5286
V. johannis var. *procumbens*	–	B	–	Maxted et al. 4146
	–	B	–	Maxted et al. 4949
V. narbonensis	–	B	–	Endo 2832
	–	B	–	Witte 15949
V. abbreviata	–	–	–	Davis 21766
	–	–	–	Archibald 2440
V. americana var. *americana*	–	–	–	Laferriere 128
	–	–	–	Davies 984

V. americana var. *sinensis*	–	–	–	Ruijun 92
V. assyriaca	–	–	–	Maxted et al. 5041
	–	–	–	Maxted et al. 4840
V. balansae	–	–	–	Davis 46542
V. ciliatula	–	–	–	Furze & Synge 158
V. dumetorum	–	–	–	Endo 2960
	–	–	–	Wróblówna & Kostrakiewicz in 1952
V. faba	–	–	–	Endo 2839
	–	–	–	Gross in 1916
V. galeata	–	–	–	Hepper 3191
	–	–	–	Maxted et al. 4133
V. hybrida	–	–	–	Endo 2834
	–	–	–	Collector unknown
V. hyrcanica	–	–	–	Jakivoma in 1925
V. lathyroides	–	–	–	Endo 2842
	–	–	–	Endo 2825
	–	–	–	Larsen et al. in 1976
V. lutea	–	–	–	Endo 2457
	–	–	–	Bruijn 2148
V. magellanica	–	–	–	Endo 3037
V. michauxii	–	–	–	Endo 2843
V. mollis	–	–	–	Maxted et al. 2653
V. noeana	–	–	–	Maxted et al. 4854
	–	–	–	Maxted et al. 4952
	–	–	–	Maxted et al. 5035
V. onobrychioides	–	–	–	Mayor in 1884
V. sepium	–	–	–	Wakabayashi et al. 9280017
	–	–	–	Emura in 1974
	–	–	–	Ohashi in 1975
	–	–	–	Jeppesen & Holm-Nielsen in 1970
	–	–	–	Jokela in 1968

[a]– = calyx-tooth without spot of gathering glandular hairs; A = calyx-tooth with the spot where the surface of calyx-tooth is flat; B = calyx-tooth with the spot where the surface of calyx-tooth is sunken.
[b]1 = the lowest calyx-teeth.
[c]2 = a pair of lateral calyx-tooth.
[d]3 = a pair of upper calyx-teeth.
[e]*Vicia sativa* agg. includes *V. angustifolia* L.

the spot. As mentioned before, presence or absence of the gathering of glandular hairs is unstable in several species and we consider that the apomorphy of gathering glandular hairs may be useful to recognize infraspecific taxa in the subgenus Vicia. On the other hand, presence or absence of the sunken calyx-tooth surface on lateral calyx-tooth is almost stable. We consider that species that share this apomorphy may form a monophyletic group in subgenus Vicia. Distribution of the apomorphy is compared with recent infra-subgeneric systems (Table 3). The presence of the sunken spot on calyx-tooth is distributed mainly in species of section Faba sensu Kupicha (1976) and in section Narbonensis sensu



Figs. 10–11. SEM photos of abaxial surfaces (10) and transectional surfaces (11) of stipules of *Vicia angustifolia*. A thick arrow indicates the apical direction of stipule. Voucher specimen: Endo 2846. Scale bars = 0.3 mm in 10, and = 0.1 mm in 11. Abbreviations: E, epidermal cell; Eg, epidermal cell under glandular hair; SG, spot with gathering of glandular hairs.

Maxted (1993). However, there are some incongruences between the distributional pattern of the apomorphy and these two sections as shown in Table 3. It may be needed to revise these sections based on various evidences.

Conclusions

The formation of sunken spot enclosing glandular hairs on the calyx-tooth is presumed to be an apomorphy in the subgenus Vicia of genus *Vicia*. The distributional pattern of the apomorphy in the subgenus is considered to be important for classification of sections in the subgenus.

We are grateful to the curators of the herbaria HANU, K, MAK and TI for their kind permission for us to examine the specimens preserved in their herbaria. This work was supported in part by the Japan Society for the Promotion of Science and by the Korean Science and Engineering Foundation.

References

Barneby R. C. 1989. Fabales. *In*: Cronquist A., Holmgren A. H., Holmgren N. H., Reveal J. L. and Holmgren P. K. (eds.), Intermountain Flora. 279 pp. The New York Botanical Garden, New York.

Endo Y. and Ohashi H. 1995. The morphology of styles and stigmas in *Vicia* (Leguminosae), and its systematic implications. J. Plant. Res. **108** (1089): 17–24.

——— and ——— 1996. The pollen morphology of *Vicia* (Leguminosae). Amer. J. Bot. **83**: 955–960.

——— and ——— 1997. The morphology and anatomy of styles in Vicieae (Leguminosae). J. Jpn. Bot. **72**: 9–18.

Gams H. 1924. *Vicia*. *In*: Hegi G. (ed.), Illustrierte Flora von Mitteleuropa Band 4 Teil 3. J. F. Lehmanns Verlag, München, pp. 1506–1562.

Gunn C. R. 1979. Genus *Vicia* with notes about tribe Vicieae (Fabaceae) in Mexico and Central America. U.S. Dept. of Agriculture Technical Bulletin. **1601**: 41 pp.

Kupicha F. K. 1976. The infrageneric structure of *Vicia*. Notes Roy. Bot. Gard. Edinb. **34**: 287–326.

——— 1977. The delimitation of the tribe Vicieae (Leguminosae) and the relationships of *Cicer* L. Bot. J. Linn. Soc. **74**: 131–162.

——— 1981. Vicieae. *In*: Polhill R. M. and Raven P. H. (eds.), Advances in Legume Systematics, part 1, Royal Botanic Gardens, Kew, U.K., pp. 377–381.

Maxted N. 1993. A phenetic investigation of *Vicia* L. subgenus Vicia (Leguminosae, Vicieae). Bot. J. Linn. Soc. **111**: 155–182.

——— 1994. A phenetic investigation of *Vicia* section Peregrinae Kupicha (Leguminosae, Papilionoideae, Vicieae). Edinb. J. Bot. **51**(1): 75–97.

———, Khattab A. M. A. and Bisby F. A. 1991. The newly discovered relatives of *Vicia faba* L. do little to resolve the enigma of its origin. Botanika Chronika **10**: 435–465.

Shah G. L. and Kothari M. J. 1973. On the structure of stomata and hairs and its bearing on the systematics

Table 3. The distribution of the apomorphy of sunken calyx-tooth surface in subgenus Vicia compared with the infrasubgeneric systems of Kupicha (1976) and Maxted (1993)[a]

Species	Sunken calyx-tooth surface	Section (Kupicha 1976)	Section (Maxted 1993)
V. abbreviata	–	Atossa	Atossa
V. balansae	–	Atossa	Atossa
V. sepium	–	Atossa	Atossa
V. faba	–	Faba	Faba
V. assyriaca	–	Hypechusa	Hypechusa
V. ciliatula	–	Hypechusa	Hypechusa
V. galeata	–	Hypechusa	Hypechusa
V. hybrida	–	Hypechusa	Hypechusa
V. hyrcanica	–	Hypechusa	Hypechusa
V. lutea	–	Hypechusa	Hypechusa
V. noeana	–	Hypechusa	Hypechusa
V. mollis	–	Peregrinae	Hypechusa
V. michauxii	–	Peregrinae	Peregrinae
V. lathyroides	–	Vicia	Wiggersia
V. grandiflora	–	Vicia	Vicia
V. sativa agg.	–	Vicia	Vicia
V. pannonica	–	Hypechusa	Hypechusa
V. anatolica	–	Hypechusa	Hypechusa
V. melanops	–	Hypechusa	Hypechusa
V. sericocarpa	–	Hypechusa	Hypechusa
V. oroboides	–	Atossa	Atossa
V. aintabensis	–	Peregrinae	Peregrinae
V. peregrina	–	Peregrinae	Peregrinae
V. pyrenaica	±	Vicia	Vicia
V. barbazitae	+	Vicia	Vicia
V. bithynica	+	Faba	Bithynicae
V. galilaea var. *faboides*	+	Faba	Narbonensis
V. hyaeniscyamus	+	Faba	Narbonensis
V. johannis	+	Faba	Narbonensis
V. narbonensis	+	Faba	Narbonensis

[a] + = present; – = absent.

in the tribe Vicieae (Papilionaceae). Flora **162**: 533–548.

Wiley E. O. 1981. Phylogenetics: the theory and practice of phylogenetic systematics. 439 pp. John Wiley & Sons, New York.

Appendix

A list of voucher specimens of the species examined.

Vicia abbreviata Fisch. ex Sprengel
TURKEY. Prov. Kastamonu: Davis 21766 (K).
IRAN. Elburz Mts.: J. C. Archibald 2440 (K).

V. aintabensis Boiss. & Hausskn.
SYRIA. G. Samuelsson in 1933 (K).

V. americana Mühl. ex Willd. var. *sinensis* Gunn
CHINA. Harbin: L. Ruijun 92 (HANU).

V. americana Mühl. ex Willd. var. *americana*
U.S.A. Wisconsin: Laferriere 128 (TI).
CANADA. Vancouver Isl.: B. W. Davies 984 (TI).

V. anatolica Turrill
TURKEY. Prov. Danizili: N. Maxted et al. 4498 (K).
Kisvak: Cheese & Wabson 1316 (K).

V. assyriaca Boiss.

TURKEY. Prov. Gaziantep: N. Maxted et al. 4840 (K), 5041 (K).

V. balansae Boiss.

TURKEY. Prov. Gaziantep: N. Maxted et al. 4840 (K), 5041 (K).

V. balansae Boiss.

TURKEY. Kars: Davis 46542 (K).

V. barbazitae Ten. & Guss.

TURKEY. Prov. Izmir: N. Maxted et al. 4319 (K).

V. bithynica (L.) L.

Cultivated at Chiba, JAPAN. Seeds obtained from Jard. Bot. Barcelona, Spain: Y. Endo 2830 (CBM).

FRANCE. Nice: Dunant in 1861 (TI).

V. ciliatula Lipsky

TURKEY. Ponric: Furze & Synge 158 (K).

V. dumetorum L.

Cultivated at Chiba, JAPAN. Seeds obtained from Biowissenshaften der Karl Marx Univ., Germany: Y. Endo 2960 (CBM).

POLAND. Kraków: W. Wróblówna & K. Kostrakiewicz in 1952 (TI).

V. faba L.

Cultivated at Chiba, JAPAN. Seeds obtained from Univ. Bot. Gard., Oxford, England: Y. Endo 2839 (CBM). Seeds origin unknown: T. Wakana 892 (CBM).

Cultivated at unknown site: R. Gross in 1916 (TI).

V. galeata Boiss.

ISRAEL. Mt. Carmel: F. N. Hepper 3191 (K).

TURKEY. Prov. Adana: Maxted et al. 4133 (K).

V. galilaea Plitm. & Zoh. var. *faboidea* (Plitm. & Zoh.) Schäfer

TURKEY. Davis 42324 (K). Renkoei: P. Ascherson (K).

V. grandiflora Scop.

Cultivated at Chiba, JAPAN. Seeds obtained from Bot. Gart. der Technishen Univ., Dresden, Germany: Y. Endo 2824 (CBM).

U.S.A. North Carolina: J. E. Freeman 42 (TI).

ROMANIA. Craiova: C. Malos in 1963 (TI). Caras: G. Bujorean in 1933 (TI).

V. hyaeniscyamus Mouterde

SYRIA. Prov. Homs: Maxted et al. 1759 (K), 1815 (K).

V. hybrida L.

Cultivated at Chiba, JAPAN. Seeds obtained from Jard. Bot. de la Ville et de L'Univ. de Caen, France: Y. Endo 2834 (CBM).

FRANCE. Roquebrune: Collector unknown (TI).

V. hyrcanica Fischer & C.A.Meyer

UZBEKSKAYA. Kattakurgan: Jakivoma in 1925 (TI).

V. johannis Tamamschian

TURKEY. Prov. Maras: Maxted et al. 5286 (K).

V. johannis Tamamschian var. *procumbens* Schäfer

TURKEY. Prov. Adana: Maxted et al. 4146 (K). Prov. Gaziantep: Maxted et al. 4949 (K).

V. lathyroides L.

Cultivated at Chiba, JAPAN. Seeds obtained from Hort. Bot., Bergianus, Sweden: Y. Endo 2842 (CBM).

GERMANY. West of Kiel: K. Larsen et al. in 1976 (TI).

V. lutea L.

Cultivated at Chiba, JAPAN. Seeds obtained from Bot. Gard. of the Univ. of Coimbra, Portugal: Y. Endo 2457 (TUS).

NETHERLANDS. Gelderland: A. J. de Bruijn 2148 (TI).

V. magellanica Hook. f.

CHILE. Magallanes: Y. Endo 3037 (CBM).

V. melanops Sibth. & Smith

TURKEY. Prov. Izmir: N. Maxted et al. 4321 (K), 4413 (K), 4440 (K), 4454 (K).

V. michauxii Sprengel

Cultivated at Chiba, JAPAN. Seeds obtained from Hort. Bot. Hauniensis, Denmark: Y. Endo 2843 (CBM).

V. mollis Boiss. & Hausskn. ex Boiss.

SYRIA. Prov. Suweida: N. Maxted et al. 2653 (K).

V. narbonensis L.

Cultivated at Chiba, JAPAN. Seeds obtained from Hort. Bot. Iassiensis, Romania: Y. Endo 2832 (CBM).

FRANCE. Hérault: G. F. de Witte 15949 (TI).

V. noeana Reuter ex Boiss.

TURKEY. Prov. Gaziantep: N. Maxted et al. 4854 (K), 4952 (K), 5035 (K).

V. onobrychioides L.

SWITZERLAND. Valais: Mayor in 1884 (TI); collector unknown in 1851 (TI).

V. oroboides Wulfen

Cultivated at Chiba, JAPAN. Seeds obtained from Neuer Bot. Gart. der Univ., Göttingen, Germany: Y. Endo 2845 (CBM).

V. pannonica Crantz

Cultivated at Chiba, JAPAN. Seeds obtained from Hort. Bot. Hauniensis, Denmark: Y. Endo 2831 (CBM).

NETHERLANDS. Gelderland: A. J. de Bruijn 2147 (TI).

ROMANIA. Transylvania: G. Bujorean in 1926 (TI).

FRANCE. Hérault: G. F. de Witte 15991 (TI).

V. peregrina L.

Cultivated at Chiba, JAPAN. Seeds obtained from Hort. Bot. Hauniensis, Denmark: Y. Endo 2827 (CBM).

SWITZERLAND. Vaud: Collector unknown (TI).

V. pyrenaica Pour.

FRANCE. Pyrenees: H. Bordere in 1857 (TI), in 1864 (TI); Forestier (TI).

V. sativa L. agg.

JAPAN. Chiba Pref.: Y. Endo 2846 (CBM). Miyagi Pref.: H. Sakai et al. in 1983 (TUS).

CHILE. Isl. Chiloe: Y. Endo 3006 (CBM).

U.S.A. Virginia: T. Shimizu et al. in 1980 (TI).

UZBEKSKAYA. Tyanshan: Popov in 1926 (TI).

V. sepium L.

RUSSIA. Akademgorodok: M. Wakabayashi et al. 9280017 (CBM, MAK). Leningrad: H. Ohashi in 1975 (TI).

GERMANY. Hessen: K. Emura in 1974 (TI).

DENMARK: Södring: S. Jeppesen & L. Holm-Nielsen in 1970 (TI).

FINLAND. Nylandia: P. S. Jokela in 1968 (TI).

V. sericocarpa Fenzl

SYRIA. Prov. Allathqiyah: N. Maxted et al. 1975 (K). Prov. Halab: N. Maxted et al. 2196 (K). Prov. Idlib: N. Maxted et al. 2262 (K).

遠藤泰彦[a]，大橋広好[b]：マメ科ソラマメ属植物の萼歯上の蜜腺の形態学的および解剖学的な特徴とその分類学的意義

マメ科ソラマメ属Vicia亜属に所属する30種について，萼歯背軸面での腺毛の分布状態を検討した．その結果14種では，少数の腺毛がほぼ一様に散生している状態が認められ，他の16種では，萼歯背軸面中央部で多数の腺毛が密生している状態が認められた．さらに，後者において，腺毛密生部で萼歯表面が凹入しているものと，凹入しないものの2型が識別された．これら萼歯の特徴に関し，外群比較法により，以下の2つの進化の方向が推定された：1，萼歯背軸面上に少数の腺毛が散生する→萼歯背軸面中央部に多数の腺毛が密生する；2，萼歯背軸面が腺毛密生部で平坦である→同部で凹入する．萼歯背軸面が腺毛密生部で凹入するという2番目の派生形質は，Vicia亜属において節の階級での分類に有効であると推定される．

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